

## Three new species of *Canthonella* Chapin from Hispaniola, with new records and Nomenclatural changes for West Indian dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae)

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### Abstract

Three new species, *Canthonella jarmilae*, *Canthonella quesquaya*, and *Canthonella sikesi* NEW SPECIES, are described from Hispaniola. New distribution records for *Canthochilum taino* Matthews and *Canthonella parva* Chapin expand the known range of these Puerto Rican Bank species to the northern Virgin Islands. Colonization by the Old World species *Digitonthophagus gazella* (Fabricius) on Jamaica, Hispaniola, Puerto Rico, St. Croix, St. Kitts, Montserrat and Guadeloupe is documented for the first time, and the mainland American species *Pseudocanthon perplexus* (LeConte) is recorded from Grand Bahama Island, a first record for the West Indies. *Onthophagus albicornis* Palisot de Beauvois and *Onthophagus capitatus* Laporte are re-elevated to full species NEW STATUS, and their allopatric distribution on Hispaniola documented. A list of the 45 known species from the Greater Antilles and Bahama Islands is included.

**Key words:** Scarabaeinae, dung beetles, West Indies, Greater Antilles, new species, invasive species

### Resumen

Tres especies nuevas, *Canthonella jarmilae*, *Canthonella quesquaya*, y *Canthonella sikesi* ESPECIES NUEVAS, son descritas para La Española. Nuevos reportes de distribucion para *Canthochilum taino* Matthews y *Canthonella parva* Chapin, las cuales se expanden fuera del rango del Banco Puertoriqueño hasta las Islas Vírgenes. Documentamos por vez primera la colonización de las especies del Viejo Mundo *Digitonthophagus gazella* (Fabricius) en Jamaica, La Española, Puerto Rico, St. Croix, St. Kitts, Montserrat y Guadeloupe. La especie de América continental *Pseudocanthon perplexus* (LeConte) ha sido reportada para Isla Grand Bahama, el primer reporte para las Indias Occidentales. *Onthophagus albicornis* Palisot de Beauvois y *Onthophagus capitatus* Laporte han sido elevadas a la categoría de especie NUEVO ESTATUS, y se documenta su distribución allopátrica en La Española. Se incluye una lista de 45 especies conocidas en las Antillas Mayores y las Islas Bahamas

### Introduction

The Scarabaeinae of the West Indies were last fully revised by Matthews (1966), who recorded 40 species from the West Indies, 26 of these from the Greater Antilles and Bahamas. Three years later, he described two new species of *Canthochilum* Chapin and mentioned an additional undescribed species from Hispaniola (Matthews 1969). Howden (1976) added *Drepanocerus pecki* (now in *Anoplodrepanus* Simonis) from Jamaica. In an earlier paper (Ivie & Philips 1990), we described two Hispaniolan *Canthonella* Chapin, and in a companion paper (Philips & Ivie 2008), seven additional Hispaniolan *Canthochilum* species are described. We take this current opportunity to describe three new Hispaniolan *Canthonella*, revise the status of *Onthophagus cap-*

*itatus* Laporte, add distribution records for previously described species, add records of newly-arrived invasive exotic species, and summarize the fauna of the Greater Antilles and Bahamian Banks. This will bring the total number of scarabaeine species in the Greater Antilles and Bahamas to 45. The fauna includes many endemic species of conservation interest, and threats from human encroachment and invasive exotic species can only be fully appreciated if the faunal elements are documented.

## Materials and Methods

Descriptions of new species follow the format of Matthews (1966, 1969) and Ivie & Philips (1990). Specimens cited are housed in collections indicated with the following codens.

BMNH	Natural History Museum, London.
CMNC	Canadian Museum of Nature, Ottawa.
CMNH	Carnegie Museum of Natural History, Pittsburgh, Pennsylvania.
FC-INRA	Former collection of Fortuné Chalumeau, now at the Institut National de la Recherche Agronomique, Petit-Bourg, Guadeloupe.
MHND	Museo Nacional de Historia Natural, Santo Domingo.
NMNH	National Museum of Natural History, Washington, DC.
TKPC	T. K. Philips collection, Bowling Green, Kentucky.
URPB	Department of Biology, University of Puerto Rico, Rio Piedras.
UVCC	University of Vermont Collection, Burlington.
WIBF	West Indian Beetle Fauna Project, Bozeman, Montana.

## Taxonomy

### *Canthonella* Chapin, 1930

*Canthonella* Chapin is known from the West Indian islands of Cuba, Hispaniola, and Puerto Rico (six described species, Matthews 1966, Ivie and Philips 1990) and South America (eight described species, Ratcliffe and Smith 1999). Specimens of three additional Hispaniolan species and two new island records in the Virgin Islands are reported here for the first time.

### *Canthonella jarmilae* Ivie & Philips, new species

Figs. 1, 4, 7, 10, 13, 16, 19

**Diagnosis.** The distinct contrasting color pattern on the elytron and pronotum, as well as the shape of the elytral spot (Fig. 19) makes this species very easily distinguished from the other species of *Canthonella*. This species is unique in usually having the pronotal disc and always the apical half of the elytron a chestnut reddish-brown, which contrasts with the pitchy margins of the pronotal disc and the elytral area anterior to the mid-point but behind and between the whitish-yellow humeral spot. This whitish-yellow spot is narrowly separated from the pronotal base, and does not extend mesad onto the second interstria. The unique shape of the male apex of the male genitalia (Fig. 10) will further confirm the identity of this species.

**Description (male).** Body oval (Fig. 19); finely, sparsely pilose; castaneous to dark castaneous, pitchy around and between elytral maculae, along suture, and along base of pronotum; whitish-yellow spot on each elytron from 8<sup>th</sup> stria to slightly mesad of 3<sup>rd</sup>, narrowly separated from anterior margin of elytron, rounded

behind, very slightly indented at intersection with 4<sup>th</sup> stria (Fig. 7); epipleuron broadly whitish-yellow laterad of elytral spot for basal 2/3<sup>rds</sup> of distance to metacoxa; apical half of elytron without whitish-yellow spot. Eyes dorsally separated by 7X maximum width of dorsal lobe (Fig. 4). Labium with apex truncate, palpi with palpomere 2 bearded internally with long setae; base of mentum bearing 2 very long setae (Fig. 1). Pronotum as wide as base of elytra; lateral margins nearly parallel for 4/5<sup>ths</sup> length from base, rounded inwardly in apical 1/5<sup>th</sup>; basal margin distinct laterad 2<sup>nd</sup> elytral striae. Elytral striae 1–6 impunctate, consisting of 2 parallel lines, stria 7 and 8 very faintly subpunctate, 7 very weakly impressed, obsolete anteriorly on elytral spot; interstria flat, conforming to shape of elytron. Foretibia transversely truncate apically, with 2 subacute teeth externally; serrulate between and proximal to teeth, apical spur stout, wide toward apex (Fig. 13). Metatibia weakly serrulate on internal margin (Fig. 16). Adeagus with shape of phallobase apex and parameres unique, as in Fig. 10. Length: 2.3–2.5 mm, measured along midline from anterior margin of pronotum to tip of elytra.

Female: differs from male in lacking serrulations on internal margin of metatibia, the tapering apical spur of the protibia, and the more brightly contrasting difference in the castaneous versus pitchy areas on elytron and pronotum.

**TYPES.** HOLOTYPE MALE: DOM:REP.: Independencia; 30 km NW La Descubierta; Sabana Real, 1646m, cloud; forest dung tps, 25XI–; 5.XII.91, S and J Peck, 91-332 [CMNC]. ALLOTYPIC FEMALE: same data as holotype PARATYPES: 1 MALE, 2 FEMALES — same data as holotype [CMNC, TKPC, WIBF]. 1 FEMALE — DOM:REP.: Independencia; 30 km NW La Descubierta; Sabana Real, 1646m, cloud; forest carrion, 25XI–; 5.XII.91, S and J Peck, 91-331 [CMNC].

**Etymology.** Named in honor of one of the collectors, our valued friend and colleague, Jarmila Kukalová-Peck of Carleton University, Ottawa.

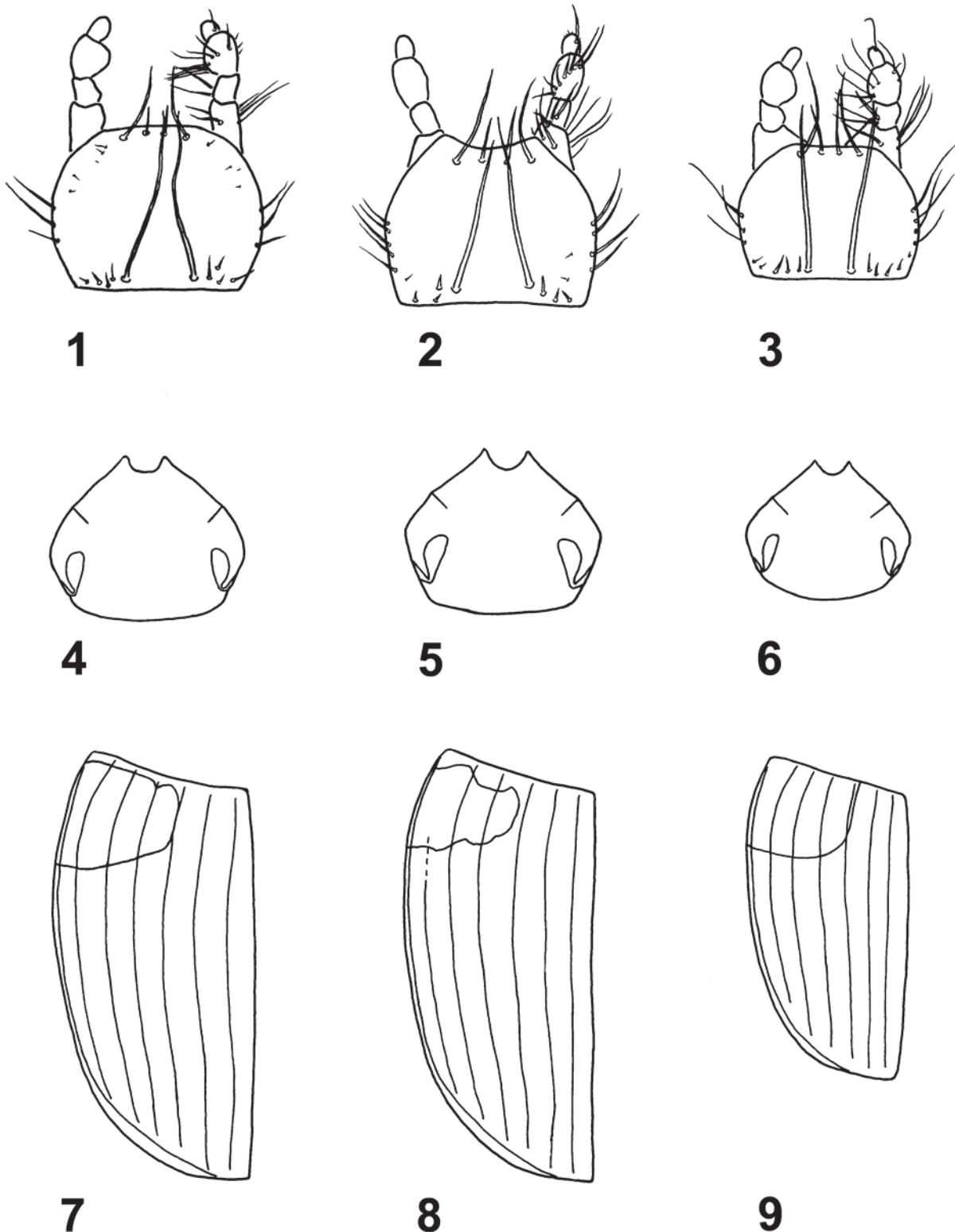
**Notes.** This is a pretty little species, with some individuals quite strikingly marked with the pronotal disc and apico-lateral areas of elytron contrastingly lighter than surrounding areas. It is known only from high elevation cloud forests in the south facing slopes of the Sierra de Neiba, an isolated massif between the Cordillera Central and Lago Enriquillo depression. Specimens were taken in dung traps and at carrion.

### *Canthonella quesqueya* Ivie & Philips, new species

Figs. 2, 5, 8, 11, 14, 17, 20

Diagnosis. The elytral spot not extending onto 3<sup>rd</sup> interstria, and not reaching elytral base, as well as the deeply punctate but weakly indicated 7<sup>th</sup> stria will distinguish this species, as will the unique shape of the apex of the male genitalia (Fig. 11).

**Description (male).** Body oval (Fig. 20); finely pilose; shining; whitish-yellow spot on each elytron from 8<sup>th</sup> stria to laterad edge of 3<sup>rd</sup>, not quite reaching base of elytra, shape irregular, anterior margin bulging forward on 3<sup>rd</sup> and 5<sup>th</sup> interval, posterior margin reaching posterior maximum on 4<sup>th</sup> or 5<sup>th</sup> interval (Fig. 8); epipleuron with small whitish-yellow spot adjacent to elytral spot, rounded and not reaching mesal margin; apical portion of elytron without whitish-yellow spot. Eyes dorsally separated by 5X maximum width of dorsal lobe (Fig. 5). Labium with apex emarginate, palpomere 2 without beard internally; base of mentum bearing 2 very long setae (Fig. 2). Pronotum as wide as base of elytra; lateral margins nearly parallel for 4/5<sup>ths</sup> from base, rounded inwardly in apical 1/5<sup>th</sup>; basal margin distinct except medially. Elytral striae 1–6 impunctate, consisting of 2 parallel lines, stria 6 obsolete on elytral spot, stria 7 indicated by few coarse punctures at mid-length, 8<sup>th</sup> punctate and impressed; interstria very weakly domed on disc, mainly conforming to shape of elytron. Foretibia weakly obliquely truncate apically, with 2 acute teeth externally; serrulate between and proximal to teeth, apical spur stout, wide toward apex (Fig. 14). Metatibia weakly serrulate on internal margin (Fig. 17). Adeagus with shape of phallobase apex and parameres unique, as in Fig. 11.



**FIGURES 1–9.** 1–3. Labia. 1. *Canthonella jarmilea*; 2. *Canthonella quesquaya*; 3. *Canthonella sikesi*. 4–6. Heads 4. *Canthonella jarmilea*; 5. *Canthonella quesquaya*; 6: *Canthonella sikesi*. 7–9. Left elytra 7, *Canthonella jarmilea*; 8. *Canthonella quesquaya*; 9. *Canthonella sikesi*.

Female: differs from male in lacking serrulations on internal margin of metatibia and the tapering apical spur of the protibia.

Length: 3.0–4.7 mm, measured along midline from anterior margin of pronotum to tip of elytra.

**TYPES.** HOLOTYPE MALE: DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII.95, 1000m; for. carrion traps; S + J Peck, 95-38 [CMNH]. ALLOTYPE FEMALE: same data as holotype.

PARATYPES: 6 MALES, 3 FEMALES — same data as holotype [CMNH, TKPC, WIBF]. 1 MALE, 5 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1000m; trop.evgrn.for, FIT; S + J Peck, 95-32 [CMNH, TKPC, WIBF]. 1 MALE, 4 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1010m; trop.evgrn.for., FIT; S + J Peck, 95-33 [CMNH]. 2 MALES, 7 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1020m; trop.evgrn.for., FIT; S + J Peck, 95-34 [CMNH, TKPC, WIBF]. 3 MALES, 2 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1100m; trop.evgrn.for., FIT; S + J Peck, 95-36 [CMNH, TKPC, WIBF]. 3 MALES, 3 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 21.VII–4.VIII.95 for.; carrión traps, 1000m; S + J Peck, 95-39 [NMNH, TKPC, WIBF]. 1 FEMALE — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 21.VII.95, trop.evgrn.; forest litter; S + J Peck, 95-44 [CMNH]. 2 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, 2 km SW; Cienaga, 2VIII.95, 1100m; forest litter; S + J Peck, 95-52 [CMNH]. 1 MALE — DOM.REP: La Vega Prov.; 12 km NE Jarabacoa; Raquet Club Rd. 550m; 4.VIII.95, broken termite; nest; S + J Peck, 95-52 [CMNH].

ADDITIONAL MATERIAL STUDIED BUT NOT INCLUDED IN TYPE SERIES: 1 FEMALE — DOM.REP: La Vega Prov.; 24 km E. El Rio; 03 SEPT 1997; P. W. Kovarik colr.; cloud forest litter [WIBF]

**Etymology.** Quesqueya is the name for Hispaniola in the indigenous Taino language. It is here considered as a noun in apposition.

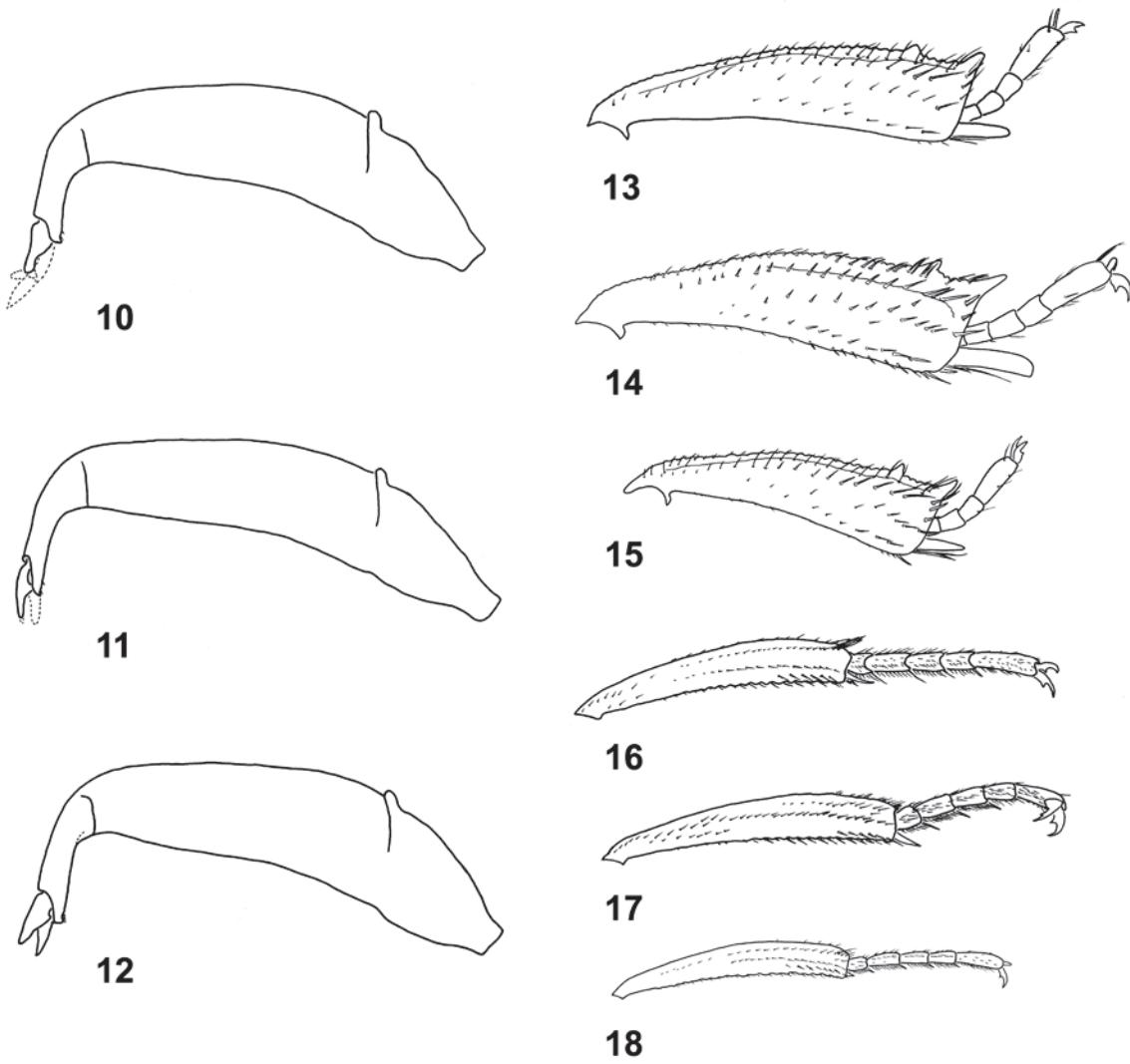
**Notes.** The majority of specimens examined were taken near La Cienaga, in the Cordillera Central, at elevations near 1,000 m. As with most of the small scarabaeines of Hispaniola, the majority of specimens were taken in flight intercept traps, but a few were taken at carrión and in leaf litter. One intriguing specimen is from a broken termite nest at lower elevation. Interestingly, most of the specimens taken at carrión were males (10 of 17) but in FITs the ratio is reversed, where only 7 of 25 being males.

#### *Canthonella sikesi* Ivie and Philips, new species

Figs. 3, 6, 9, 12, 15, 18, 21

**Diagnosis.** This small species is very similar to *C. pygmaea* Harold and *C. isabellae* Matthews, but can be distinguished from those and all other described *Canthonella* species by the combination of a yellow-orange elytral macula that reaches the basal margin (separate in *C. pygmaeus*), and the impunctate 8<sup>th</sup> elytral stria (strongly punctate in *C. isabellae*). The unique shape of the apical portions of the aedeagus will further distinguish this species (Fig. 12).

**Description (male).** Oval (Fig. 21), strongly convex, finely pilose, shining black, yellow-orange spot along anterior margin of elytron from third elytral stria to humeral angle and across epipleuron (occasionally and faintly extending onto second interval), extending to posterior edge of metasternum (Fig. 9). Eyes dorsally separated by 8X maximum width of dorsal lobe (Fig. 6). Labium with apex slightly raised; slightly produced and angulate in hind view; anterior margin truncate to slightly emarginate in ventral view; palpi bearded with long setae medially; base of mentum bearing 2 very long setae (Fig. 3). Pronotum at base nearly as wide as base of elytra, parallel sided for basal 3/4, evenly rounded at anterior 1/4; basal margin very fine to obsolete medially. Elytral striae 1–8 impunctate, consisting of 2 fine parallel lines, 7 obsolete on humerus; interstriae flat, conforming to shape of elytron. Foretibia transversely truncate apically, with 2 acute teeth externally; serrulate between and proximal to teeth. Metatibia weakly serrulate on internal margin (Fig. 18). Adeagus with shape of phallobase apex and parameres unique, as in Fig. 12. Length: 2.50–2.51mm, measured along midline from anterior margin of pronotum to tip of elytra.



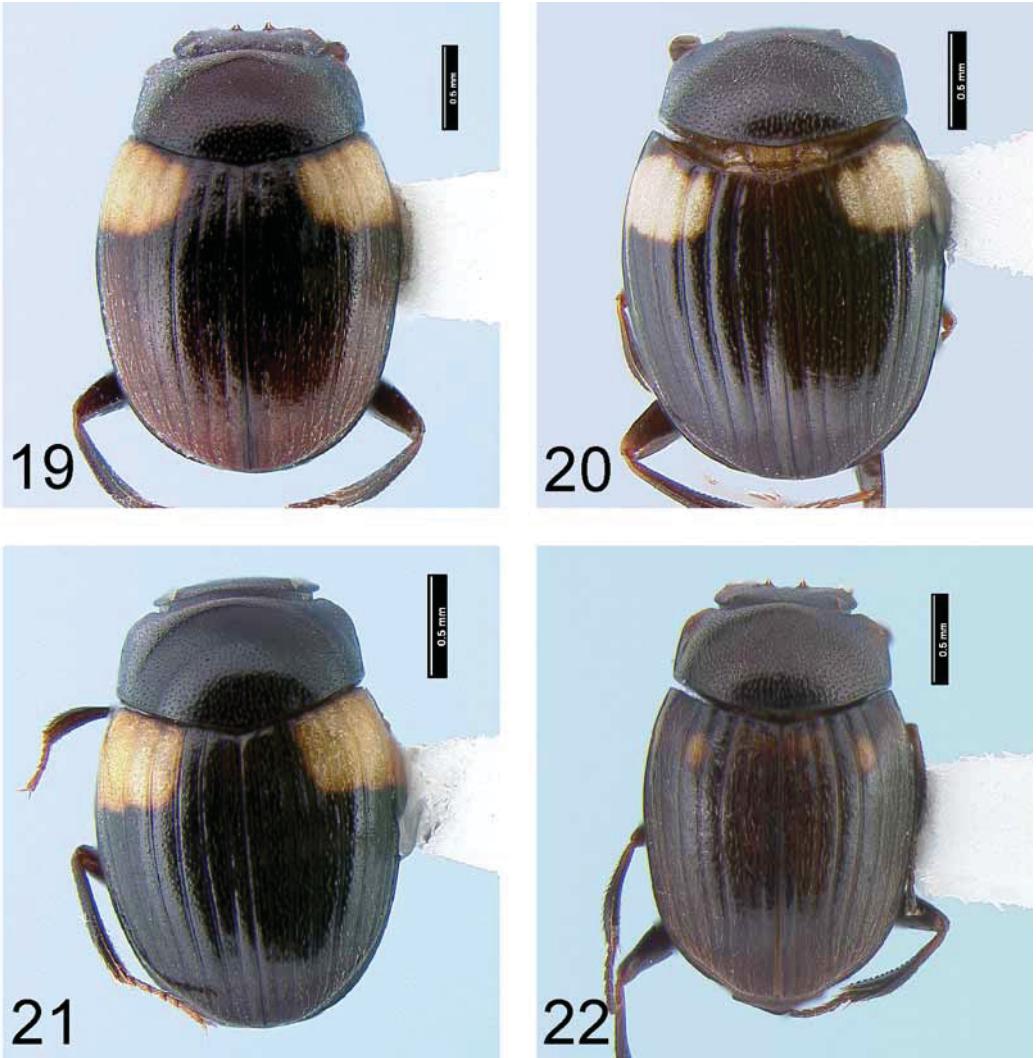
**FIGURES 10–18.** 10–12. Male genitalia, lateral view. 10. *Canthonella jarmilea*; 11. *Canthonella quesquaya*; 12. *Canthonella sikesi*. 13–15. Right profemur and tarsus Fig. 13: *Canthonella jarmilea*; 14. *Canthonella quesquaya*; 15. *Canthonella sikesi*; 16–18. Right metafemur and tarsus 16. *Canthonella jarmilea*; 17. *Canthonella quesquaya*; 18. *Canthonella sikesi*.

Female. Differs as in other Hispaniolan *Canthonella*, i.e. the apical spine of the protibia is less stout than that of the male, and the interior margin of the female metatibia is not serrulate.

**TYPES.** HOLOTYPE MALE: DOM REP: Prov Hato Mayor; Par. Nac. Los Haitises; 16APR–01JULY1992; F.I.T.#1, bosque humido; M.Ivie, D.Sikes, Lanier [from WIBF, deposited in NMNH]. ALLOTYPE FEMALE: same data as holotype.

PARATYPES: 12 MALES, 10 FEMALES — same data as holotype [CMNC, MHND, TKPC, WIBF]. 1 MALE — DOM.REP: Prov. Hato Mayor; Par. Nac. Los Haitises; 18–21 JULY 1993; D. S. Sikes and R. Rosenfeld; flight intercept trap [TKPC]. 3 MALES, 1 FEMALE — DOM.REP: Pr. Hato Mayor; Par. Nac. Los Haitises; 02 JULY 1992 – 16 JULY 1993, D. Sikes and R. Rosenfield; flight intercept trap [WIBF]. 1 FEMALE — DOM REP: Prov Hato Mayor; Par. Nac. Los Haitises; 01–16APR1992; dung bait; pit. trap, bosque humido; M.Ivie, D.Sikes, Lanier [WIBF]. 1 FEMALE — Samana; Samana RD; VII 29 1978; R. O. Schuster [UCDC]. 1 MALE — Cabrera; Rep. Dom; VIII 1 1978; R. O. Schuster [UCDC].

ADDITIONAL MATERIAL STUDIED BUT NOT INCLUDED IN TYPE SERIES: 2 specimens, same data as holotype, disarticulated [TKPC].



**FIGURES 19–22.** Dorsal habiti. 19. *Canthonella jarmilea*; 20. *Canthonella quesquaya*; 21. *Canthonella sikesi*; 22. *Canthonella constans*.

**Etymology.** Named after Derek S. Sikes, a valued student, colleague, and friend, as well as one of the collectors of this species.

**Notes.** This species is very similar to, and possibly a vicariant sister-species of, *C. isabellae* Matthews. It is known only from the mesic north coast, while *C. isabellae* is known only from the drier southern areas.

The type locality is in Parque Nacional de Los Haïtises, a karst area west of Sabana de la Mar, on the Bahia de San Lorenzo (Hoppe 1989). The flight intercept trap (FIT) was located in an area of soil accumulation between limestone "magote" hills, covered in mesic forest. Interestingly, another FIT a very short distance away, but on the rock of the magote, did not capture any of this species. The 2 paratypes not from the Los Haïtises FITs are from the area across Samana Bay from Los Haïtises and on the north coast a short distance to the west of the Samana Peninsula.

#### Key to West Indian *Canthonella* Chapin

(Modified from Matthews 1966, Ivie & Philips 1990)

1. Protibia with 3 teeth on outer margin ..... 2
- Protibia with 2 teeth on outer margin ..... 3

2. Elytral interstriae uneven in height, especially on declivity; protibia very narrow; Puerto Rico and the Virgin Islands..... *Canthonella parva* Chapin
- Elytral interstriae flat, even in height; protibia widened apically; Hispaniola .....
- ..... *Canthonella constans* Matthews (Fig. 22) 4
3. Elytral macula yellow-orange, reaching base of elytron (Fig. 9); Hispaniola..... 5
- Elytral macula whitish-yellow, not reaching base of elytron, with at least a narrow black margin at base (Figs. 7, 8); Cuba and Hispaniola .....
4. Mesad edge of elytral spot reaching or nearly reaching suture; eighth elytral stria strongly punctate .....
- ..... *Canthonella isabellae* Matthews (Fig. 23)
- Mesad edge of elytral spot reaching to 2<sup>nd</sup> stria; eighth elytral stria impunctate .....
- ..... *Canthonella sikesi* new species (Fig. 21) 6
5. Elytral spot ending at or laterad to 3<sup>rd</sup> stria (Figs 7, 8); labium rounded, truncate or emarginate anteriorly (Figs. 1, 2 and Ivie & Philips 1990, Fig. 1); Cuba and Hispaniola..... 8
- Elytral spot extending at least half-way across 2<sup>nd</sup> interstria (Ivie & Philips 1990, Figs. 3, 4); labium obtusely produced anteriorly; Hispaniola .....
6. Labium narrow, subtruncate (Matthews 1966, Fig. 84); Cuba .....
- ..... *Canthonella pygmaea* (Harold) 7
- Labium broader, truncate or emarginate (Figs. 1, 2); Hispaniola .....
7. Elytral ground color castaneous, darker pitchy around elytral spot and along suture, pronotal disc usually castaneous with pitchy base; labium truncate apically (Fig. 1) .....
- ..... *Canthonella jarmilae* new species (Fig. 19)
- Elytral and pronotal ground color black; labium emarginate apically (Fig. 2) .....
- ..... *Canthonella quesqueya* new species (Fig. 20)
8. Elytron with triangular spot at apex of interstriae 1, 2, and 3; a smaller (occasionally obsolete) macula at apex of stria 5; 3.3–4.8 mm .....
- ..... *Canthonella baorucensis* Ivie & Philips (Fig. 24)
- Elytron immaculate in apical ½; 2.3–3.4 mm..... *Canthonella howdeni* Ivie & Philips (Fig. 25)

#### Distributional notes on native West Indian Scarabaeinae

##### *Canthonella isabellae* Matthews, 1966

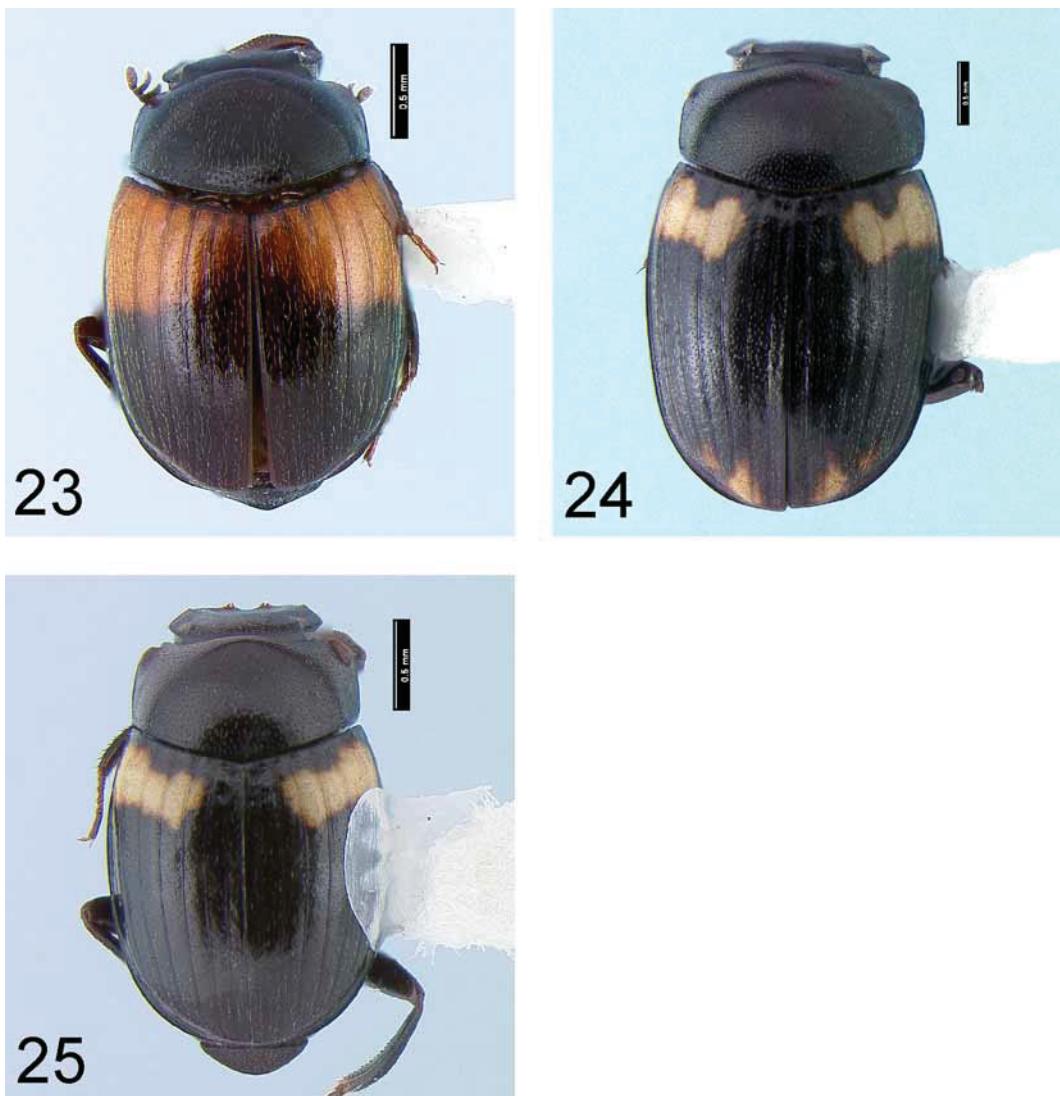
An additional record for this species has been seen, from very near the type locality: DOMINICAN REPUBLIC: Prov. San Cristobal, 4 km NW Altamaria, 300m, 12APR-06JULY1992, M. A. Ivie and D. S. Sikes, flight intercept trap (WIBF).

##### *Canthonella parva* Chapin, 1930

Previously known only from Puerto Rico, this is the first report of this species from the Virgin Islands: ST. THOMAS: 1 — Est. Enighed, Magens Bay Arboretum, 01 JAN 1993, VIBFP colrs (WIBF); 1 — Est. Botany Bay, 29 JULY–15 OCT 1994, M. A. and L. L. Ivie, flight intercept trap (WIBF). This discovery of an allopatric population of *C. parva* on a second island calls for reevaluation of the subspecies concepts in this species, but this is beyond the scope of this paper.

***Canthochilum taino* Matthews, 1966**

Previously known only from Puerto Rico, this is the first report of this species from the Virgin Islands: VIRGIN ISLANDS: ST. JOHN: 44 — Est. Lameshur Bay, various dates and specific localities, W. B. Muchmore, pitfall trap (44 WIBF, 2 CMNC); 1 — Est. 1'Esperance, 17 JAN 1986, W. B. Muchmore, litter at base of large tree (WIBF); 1 — Fish Bay Gut, 02 JAN 1966, R. T. Bell (UVCC). TORTOLA: 90 — Mt. Sage National Park, various dates, specific localities and collectors (NMNH, TKPC, WIBF).



**FIGURES 23–25.** Dorsal habitus. 23. *Canthonella isabellae*; 24. *Canthonella baorucensis*; 25. *Canthonella howdeni*.

***Onthophagus albicornis* Palisot de Beauvois, 1805 and *Onthophagus capitatus* Laporte, 1840, NEW STATUS**

Matthews (1966) treated *Onthophagus capitatus* as a subspecies of *Onthophagus albicornis*. He noted that although the genitalia were identical, he had seen no intermediates between the two forms. At the time, he had seen only a few specimens of each, and thought that the geographic division was west (Haiti) and east (Dominican Republic). Since that time, hundreds of specimens have accumulated, and the status of these two populations as full species seems warranted. No intermediate forms have been observed, and the two seem to be allopatric vicariant species. Both species inhabit low elevation, open habitats, but *Onthophagus albicornis*

occurs on the northern paleoisland in both countries north of the Lago Enriquillo depression, while *Onthophagus capitatus* also occurs in both countries but in the southern peninsula of Haiti and the Baoroco-LaSalle massif, extending north in Haiti as far as the Trou d'Eau mountains and the Cul de Sac Plain.

## New Island Records for Invasive Scarabaeinae

### *Digitonthophagus gazella* (Fabricius, 1787)

This African native (sometimes known as *Onthophagus gazella*) has been widely introduced to the US mainland in an attempt to control dung flies and helminth parasites, and improve dung incorporation (Fincher *et al.* 1983). Since that time, it has proven to be highly mobile and invasive. From initial releases in Texas in 1972, this species has become established from Florida, Georgia, and Missouri to California (Fincher *et al.* 1983, Vulinec & Eudy 1993, MacRae & Pen 2001), and has invaded Mexico, Guatemala and Nicaragua, as well as the western Caribbean island of San Andrés (Rivera-Cervantes & Garcia-Real 1991, Montes de Oca 2001, Noriega & Jorge 2002). It is also present in South America, where it was introduced in the 1980s (Aidar *et al.* 2000).

The documentation of this species in the West Indies is very weak. Chalumeau (1983) did not record this species from the French Antilles, but in the only published record from the West Indies it had reached the Windward Island of Martinique by 1992 (Huchet 1992). We have discovered that this species is present on several islands of the Greater Antilles (Jamaica, Hispaniola, Puerto Rico, and St. Croix), as well as the Leeward Islands of St. Kitts,Montserrat, and Guadeloupe. Although it was not recorded from Grenada by Woodruff *et al.* (1998), it is probably now widely distributed on islands with cattle..

The earliest West Indian populations of *D. gazella* known to us were discovered in the Dominican Republic at 4 km W. Oviedo, 28 November 1990-04 February 1991, in flight intercept traps placed in arid thorn forest by L. Manser and S. Peck (CMNC). Later that year, it was taken on the north coast of Jamaica at St. Ann's, 2 mi. E. Discovery Bay, Runaway Caves, 25 March-01 April 1991 by T. K. Philips and L. Gerofsky (TKPC). The next year, specimens were collected in widely distributed areas of the Dominican Republic, at Prov. San Pedro de Macoris, Estacion de Acuacultura, 13 April 1992 (MNHD), at Prov. La Altagracia, Parque Nacional del Este, Boca de Yuma on 30 April by K. A. Guerrero and F. Del Monte (MNHD), and at Prov. Altamira, 2 km N. Bayahibe, 3 July 1992 (CMNH). Further early Hispaniolan records include Prov. Pedernales, Cabo Rojo to 9.5 km N of Cabo Rojo 5-42m, 8-10 July 1993 (WIBF); Prov. Independencia, S. Lago Enriquillo, 12 July 1993 (WIBF); and Prov. San Juan, 11 km SE Ingenio, Presa de Sabaneta, nr. shore, 19.021N, 71.181W, 31 August 1995 (CMNH).

By 1996, *D. gazella* had reached Puerto Rico and St. Croix, as documented by Cruzian records from 4 km S. Fredriksted, at black light on 13 February 1996, W.E. Steiner and J. M. Sweringen, and 4 km NW Christiansted on 08 February 1996 (NMNH, WIBF). The earliest known Puerto Rican specimen is from Aricebo, vac. Cueva Vaca, 04 April 1996 collected by L. A. Barley, in dung (URPB).

The earliest Lesser Antillean specimens of *D. gazella* we have seen are from Marie-Gallant, taken in August 1992 (FC-INRA). Five months later it was found on the neighboring island of Basse-Terre, taken at Montebello 10 JAN 1992 by Dubois (FC-INRA). Later, F. Chalumeau collected *D. gazella* on Basseterre at St. Rose, Sofaia, in October 1996 (WIBF). On Montserrat it was common by 24 June 2000 in cow dung on the north end of the island, at least as far south as the Lower Belham River and Isles Bay (WIBF). In 2003, it was found in cow pats on St. Kitts at St. Peter Basseterre Parish, Bayfor's, 02 JULY July 2003 (WIBF). A partial specimen was found on Anguilla under a rotten log in a cow pasture at Low Ground on 17 May 2004 (WIBF).

Thus this species is now on at least nine West Indian islands, with more undiscovered populations probable. Because *D. gazella* has been implicated in the decline of native species in Texas (Howden & Scholtz

1986), this particular introduction comes as a very real threat to the native West Indian dung beetles we are just beginning to document. On Hispaniola, *Canthon violaceus* (Oliver) and *C. signifer* Harold were common in open areas before the arrival of *D. gazella*, but may already be reduced in numbers or extirpated from areas now occupied by *D. gazella*. Both native species were seen by the hundreds in Prov. Pedernales in 1988 (Ivie, Philips, and Johnson expedition), as was *C. violaceus* in Prov. Independencia in 1991 (Rawlins expedition) and 1992 (Ivie and Ivie expedition). Neither species has been found in those areas in our visits subsequent to the establishment of *D. gazella*, and only once has either been found elsewhere after *D. gazella* is present — 8 specimens of *C. violaceus* were taken with the 1992 Bayahibe collection (CMNH). It would be a further sad comment on the decreasing richness of the world's biodiversity if these two beautiful scarabs were pushed out by another of man's weedy tag-alongs.

Jamaica also has large endemic species that could be harmed by this introduction, most importantly the pasture-dwelling *Sulcophanaeus carnifex* (Linnaeus), *Pseudocanthon jamaicensis* Matthews, and even possibly the forest-endemic Jamaican genus *Anoplodrepanus*, including *A. reconditus* (Matthews) and *A. pecki* (Howden). We have no data to indicate if impacts have occurred, but encourage others with access to such data to make them known as soon as possible.

Matthews' (1966) key to the West Indian genera does not include *Digitophophagus gazella*, but it cannot be confused with any of the West Indian species illustrated by him. Huchet (1992) gave diagnoses for both the genus and species.

### ***Pseudocanthon perplexus* (LeConte, 1847)**

A series of specimens of this widespread mainland species (Arizona to Indiana, south to Brazil) from Grand Bahama Island, Freeport, were taken 20–27 June 1987 by W. E. Steiner, M. J. and R. Molineaux (NMNH, WIBF). This is apparently the first report of *P. perplexus* from the West Indies, and given its dung requirements (Blume 1982), almost certainly represents a recent arrival on Grand Bahama. *Pseudocanthon perplexus* differs from all previously recorded West Indian *Pseudocanthon* except *P. chlorizans* (Bates) (recorded from Mexico and the southernmost Lesser Antilles [Grenada and the Grenadines of Union, Carriacou, Mustique, and Bequia], Matthews 1966, Woodruff *et al.* 1998) in lacking a basal carina on the pygidium. It should be noted that Howden (1966) and Woodruff (1973) both raised the question of validity of *P. chlorizans*. *Pseudocanthon perplexus* is purported to differ from *P. chlorizans* by the denser pronotal punctures, in which the discal punctures are separated by 1.0–1.5 diameters, compared with the 2.0 or more diameters that separate them in *P. chlorizans* (Howden 1966). The pronotum in *P. chlorizans* is also said to be much shinier, with the punctures simple, while in *P. perplexus* the pronotal punctures are larger, microumbicate in appearance, and the surface less shining (Howden 1966). Blume (1982) described the larva and biology of *P. perplexus* in Texas.

### **Checklist of the Greater Antillean and Bahamian Scarabaeinae**

- |                                                            |                                                                                                         |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1. <i>Onthophagus marginatus</i> Laporte, 1840             | Cuba                                                                                                    |
| 2. <i>Onthophagus albicornis</i> Palisot de Beauvois, 1805 | Hispaniola                                                                                              |
| 3. <i>Onthophagus capitatus</i> Laporte, 1840              | Hispaniola                                                                                              |
| 4. <i>Digitonthophagus gazella</i> (Fabricius, 1787)       | Hispaniola, Jamaica, Puerto Rico, St. Croix, Anguilla, St. Kitts, Montserrat, Marie-Galante, Basseterre |
| 5. <i>Euoniticellus cubiensis</i> (Laporte, 1840)          | Cuba, Jamaica, Isla de la Juventud, Bahama                                                              |

6.	<i>Anoplodrepanus reconditus</i> (Matthews, 1966)	Ilands (New Providence, Eleuthera)
7.	<i>Anoplodrepanus pecki</i> (Howden, 1976)	Jamaica
8.	<i>Sulcophanaeus carnifex</i> (Linnaeus, 1758)	Jamaica
9.	<i>Canthochilum baracutey</i> Zayas & Matthews, 1966	Cuba
10.	<i>Canthochilum darlingtoni</i> Matthews, 1969	Hispaniola
11.	<i>Canthochilum ciboney</i> Matthews, 1969	Hispaniola
12.	<i>Canthochilum</i> sp. Matthews 1969	Hispaniola
13.	<i>Canthochilum</i> #1 Philips & Ivie, 2008	Hispaniola
14.	<i>Canthochilum</i> #2 Philips & Ivie, 2008	Hispaniola
15.	<i>Canthochilum</i> #3 Philips & Ivie, 2008	Hispaniola
16.	<i>Canthochilum</i> #4 Philips & Ivie, 2008	Hispaniola
17.	<i>Canthochilum</i> #5 Philips & Ivie, 2008	Hispaniola
18.	<i>Canthochilum</i> #6 Philips & Ivie, 2008	Hispaniola
19.	<i>Canthochilum</i> #7 Philips & Ivie, 2008	Hispaniola
20.	<i>Canthochilum tureyra</i> Zayas & Matthews, 1966	Cuba
21.	<i>Canthochilum cemi</i> Zayas & Matthews, 1966	Cuba
22.	<i>Canthochilum histeroides</i> (Harold, 1868)	Cuba
23.	<i>Canthochilum guayca</i> Zayas & Matthews, 1966	Cuba
24.	<i>Canthochilum anacaona</i> Zayas & Matthews, 1966	Cuba
25.	<i>Canthochilum gundlachi</i> (Harold, 1868)	Cuba
26.	<i>Canthochilum pijirigua</i> Zayas and Matthews, 1966	Cuba
27a.	<i>Canthochilum hispidum hispidum</i> Chapin, 1934	Puerto Rico
27b.	<i>Canthochilum hispidum iunceanum</i> Matthews, 1965	Puerto Rico
28.	<i>Canthochilum oakleyi</i> Chapin, 1934	Puerto Rico
29.	<i>Canthochilum borinquensis</i> Matthews, 1965	Puerto Rico
30.	<i>Canthochilum andyi</i> Chapin, 1935	Puerto Rico
31.	<i>Canthochilum taino</i> Matthews, 1966	Puerto Rico, St. John, Tortola
32.	<i>Canthonella pygmaea</i> (Harold, 1869)	Cuba
33a.	<i>Canthonella parva parva</i> Chapin, 1930	Puerto Rico
33b.	<i>Canthonella parva luquillensis</i> Matthews, 1965	St. Thomas
34.	<i>Canthonella isabellae</i> Matthews, 1966	Puerto Rico
35.	<i>Canthonella constans</i> Matthews, 1966	Hispaniola
36.	<i>Canthonella baorucensis</i> Ivie & Philips, 1990	Hispaniola
37.	<i>Canthonella howdeni</i> Ivie & Philips, 1990	Hispaniola
38.	<i>Canthonella jarmilae</i> NEW SPECIES	Hispaniola
39.	<i>Canthonella sikesi</i> NEW SPECIES	Hispaniola
40.	<i>Canthonella quesqueya</i> NEW SPECIES	Hispaniola
41a.	<i>Pseudocanthon jamaicensis jamaicensis</i> Matthews, 1966	Jamaica
41b	<i>Pseudocanthon jamaicensis viridescens</i> Matthews, 1966	Jamaica
42.	<i>Pseudocanthon perplexus</i> (LeConte, 1847)	N. America and Bahamas
43.	<i>Canthon violaceus</i> (Olivier, 1789)	Hispaniola
44.	<i>Canthon callosus</i> Harold, 1868	Hispaniola, Gonaïve
45.	<i>Canthon signifer</i> Harold, 1868	S. Hispaniola

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